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EXAMINER
CONTINO, PAUL F

ART UNIT	PAPER NUMBER
2114	

DATE MAILED: 08/04/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

	Application No.	Applicant(s)
Office Action Summary	10/758,570	LEE ET AL.
	Examiner	Art Unit	
	Paul Contino	2114	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE <u>3</u> MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on <u>14 January 2004</u>.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) <u>1-27</u> is/are pending in the application.

    4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) <u>1-11,13,14,16-20 and 22-27</u> is/are rejected.

7)☒ Claim(s) <u>12, 15, and 22</u> is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on <u>14 January 2004</u> is/are: a)☒ accepted or b)☐ objected to by the Examiner.

    Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

    Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

    a)☐ All b)☐ Some * c)☐ None of:

      1.☐ Certified copies of the priority documents have been received.

      2.☐ Certified copies of the priority documents have been received in Application No. _____.

      3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

    * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1)☒ Notice of References Cited (PTO-892)

2)☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3)☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.

4)☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.

5)☐ Notice of Informal Patent Application (PTO-152)

6)☐ Other: _____.

DETAILED ACTION: Non-Final Rejection

Claim Objections

1.   Claims 3, 9, 17, and 23 are objected to because of the following informalities: the statement "the corresponding CCS" or "the corresponding processor unit", where the Examiner is uncertain as to what a particular CCS/processor corresponds to. Appropriate correction is required.

2.   Claim 24 is objected to because of the following informalities: the statement "the corresponding communication path", where the Examiner is uncertain as to what a particular communication path corresponds to. Appropriate correction is required.

3.   Claim 7 is objected to because of the following informalities: line 3 states "andcomputer" as one word. Appropriate correction is required.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4.   Claims 13, 19, and 27 are rejected under 35 U.S.C. 112, second paragraph, as being

indefinite for failing to particularly point out and distinctly claim the subject matter which

applicant regards as the invention.

Claim 13 recites the limitation "the normalized CCSs" in line 3. There is insufficient

antecedent basis for this limitation in the claim.

Claim 19 recites the limitation "the history" in line 1. There is insufficient antecedent

basis for this limitation in the claim.

In claim 27, line 3, the use of the language "and/or" causes the claims to be indefinite.

Claim Rejections - 35 USC § 101

35 U.S.C. 101 reads as follows:

Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or
any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and
requirements of this title.

5.   Claims 1-16 are rejected under 35 U.S.C. 101 because the claimed invention is directed

to non-statutory subject matter. Computer instructions and data structures in and of themselves

may not be patented [MPEP 2106(IV)(B)(1)]. The Examiner recommends including language

such as "computer instructions/data structures stored on a computer readable medium" in order

to overcome the non-statutory 101 rejection.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the

basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on
sale in this country, more than one year prior to the date of application for patent in the United States.

6.   Claims 1-11, 13, 14, 16, 17, 18, 20, 23, 26, and 27 are rejected under 35 U.S.C. 102(b) as

being anticipated by Jardine et al. (U.S. Patent No. 5,884,018).

As in claim 1, Jardine et al. discloses a system for fault-tolerant processing, comprising:

a processor unit *(Fig. 1 #112; column 14 lines 30-43, tie-breaker processor 112, where*

the "processor unit" may be interpreted as a single processor 112 or the entirety of Figure 1);

computer instructions executable by the processor unit and operable to:

detect at least one of: failure of other processor units in the system, and

connectivity failures that disrupt communications between the processor units *(column 14*

lines 45-67);

evaluate connectivity condition scores (CCSs) for the processor units, wherein the

processor units are operable to communicate with each other via at least two

communication paths *(column 13 lines 11-13)*, and the CCSs indicate connectivity errors

experienced on each of the communication paths *(column 13 lines 46-59, where it is*

interpreted that the connectivity matrices contain connectivity condition "scores");

determine at least two candidate groups with the same number of at least a portion

of the processor units to include in the system *(column 19 line 66 through column 20 line*

3); and

select between the at least two candidate groups based on the CCSs *(column 19*

lines 37-63 and column 20 lines 4-8 and 54-57).

As in claim 2, Jardine et al. discloses the processor units in each candidate group are

capable of communicating with the other processor units in the candidate group *(column 13 lines*

23-27 and column 19 line 66 through column 20 line 3, where it is interpreted that processors

112 may still communicate with one another because the non-failed processors are still

connected within a group).

As in claim 3, Jardine et al. discloses the severity of each connectivity error is factored

into the corresponding CCS *(column 2 line 47 through column 3 line 20, column 13 lines 46-61,*

and column 14 lines 59-67, where it is interpreted that a broken link is severe and taken into

account when determining a CCS).

As in claim 4, Jardine et al. discloses at least one of the CCSs is based on the history of

connectivity errors on the corresponding communication path *(column 13 line 46 through*

column 14 line 2, where it is interpreted that an previous error entry C(i,j) in a CCS will present

upon detection of a new error entry C(i,j)).

As in claim 5, Jardine et al. discloses computer instructions executable by the processor unit and operable to: unpack a bit mask of normalized CCSs from each processor unit *(column 4 lines 14-27, column 14 lines 22-28, and column 22 lines 51-67)*.

As in claim 6, Jardine et al. discloses computer instructions executable by the processor unit and operable to:

form a bi-directional CCS for each processor unit based on normalized CCSs *(column 16 lines 10-18)*; and

select between the two candidate groups to include in the system based on the bi-directional CCSs for the processor units in each candidate group *(column 19 line 37 through column 20 line 8, and column 20 lines 54-57)*.

As in claim 7, Jardine et al. discloses a system for fault-tolerant processing, comprising:

a processor unit *(Fig. 1 #112; column 14 lines 30-43, tie-breaker processor 112, where the "processor unit" may be interpreted as a single processor 112 or the entirety of Figure 1)* configurable to communicate with other components in the system via at least two switching fabrics *(Fig. 1; column 2 lines 63-67, column 12 lines 9-14, and column 13 lines 11-13, where redundant switch fabrics and paths between processors is interpreted as two switching fabrics)*; and computer instructions executable by the processor unit and operable to:

maintain a connectivity condition score (CCS) for each communication path along the at least two fabrics based on connectivity errors experienced on the path, wherein the CCSs are utilized to determine whether the processor unit will continue to be included in the system

(column 13 lines 46-59, where it is interpreted that the connectivity matrices [CCSs] contain connectivity condition "scores").

As in claim 8, Jardine et al. discloses the severity of each connectivity error is factored into the corresponding CCS *(column 2 line 47 through column 3 line 20, column 13 lines 46-61, and column 14 lines 59-67, where it is interpreted that a broken link is severe and taken into account when determining a CCS).*

As in claim 9, Jardine et al. discloses the number of connectivity errors during previous observation time periods are factored into the corresponding CCS during an observation time period *(column 13 line 46 through column 14 line 2, where it is interpreted that an previous connectivity error entry C(i,j) in a CCS will present upon detection of a new error entry C(i,j)).*

As in claim 10, Jardine et al. discloses the processor unit is further configured to communicate the CCSs to at least one of the other components in the system *(column 15 lines 37-40).*

As in claim 11, Jardine et al. discloses computer instructions executable by the processor unit and operable to: summarize each set of CCSs into a single score *(column 15 line 55 through column 16 line 2, where the updating by a processor 112 of a connectivity matrix C [CCS] with respect to the entirety of received CCSs is interpreted as summarizing into a single score).*

As in claim 13, Jardine et al. discloses computer instructions executable by the processor

unit and operable to: transform the normalized CCSs into a condensed format *(column 26 lines*

10-14).

As in claim 14, Jardine et al. discloses a computer product, comprising:

data structures including:

a connectivity condition score (CCS) for each communication path associated

with a processor unit in a distributed processing system, wherein the CCS indicates the

connectivity condition of the communication path during at least one observation period

(column 13 lines 46-59, where it is interpreted that the connectivity matrices contain

connectivity condition "scores" C(i,j)); and

a connectivity matrix indicating whether the processor unit is able to

communicate with other components in the system through any of the communication

paths *(column 13 lines 46-59)*.

As in claim 16, Jardine et al. discloses CCS is normalized and stored in a bit mask

(column 13 lines 54-61, where a CCS C(i,j) having only a value of 0 or 1 is interpreted as being

"normalized", and the storing of the value [inherently in a computer system] as a bit [0 or 1] is

interpreted as being stored in a bit mask).

As in claim 17, Jardine et al. discloses a method for regrouping processor units in a fault-

tolerant system, comprising:

determining the ability of each processor unit to communicate with other processor units

in the system *(column 13 lines 28-65)*;

forming at least two candidate groups with the same number of processor units that are

able to communicate with each other *(column 19 line 66 through column 20 line 3, and column

20 lines 54-57)*; and

evaluating connectivity condition scores (CCSs) for each candidate group of the

processor units, wherein each CCS indicates the connectivity condition of one communication

path associated with the corresponding processor unit *(column 19 line 37 through column 20 line

7)*.

As in claim 18, Jardine et al. discloses the CCS is based on the number of connectivity

errors experienced by the corresponding communication path *(column 19 lines 43-46)*.

As in claim 20, Jardine et al. discloses the severity of each connectivity error is factored

into the corresponding CCS *(column 2 line 47 through column 3 line 20, column 13 lines 46-61,

and column 14 lines 59-67, where it is interpreted that a broken link is severe and taken into

account when determining a CCS)*.

As in claim 23, Jardine et al. discloses an apparatus for regrouping processor units in a

fault-tolerant system, comprising:

means for forming at least two candidate groups of processor units that are able to communicate with each other *(column 19 line 66 through column 20 line 3, and column 20 lines 54-57)*; and

means for evaluating connectivity condition scores (CCSs) for each candidate group of the processor units, wherein each CCS indicates the severity of connectivity errors experienced by one communication path associated with the corresponding processor unit *(column 2 line 47 through column 3 line 20, column 13 lines 46-61, column 14 lines 59-67, and column 19 line 37 through column 20 line 7, where it is interpreted that a broken link is severe and taken into account when determining a CCS)*; and

means for selecting one of the at least two candidate groups based on the CCSs *(column 19 lines 37-63 and column 20 lines 4-8 and 54-57)*.

As in claim 26, Jardine et al. discloses means for selecting a candidate group based on the survival priority of the processor units included in each candidate group *(column 19 line 66 through column 20 line 3, and column 20 lines 54-57)*.

As in claim 27, Jardine et al. discloses means for selecting a candidate group based on the CCSs, when both candidate groups have the highest number of processor units and/or processor units with the highest survival priority *(column 20 lines 54-57)*.

*   *   *

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the

basis for the rejections under this section made in this Office action:

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed
in the United States before the invention by the applicant for patent or (2) a patent granted on an application for
patent by another filed in the United States before the invention by the applicant for patent, except that an
international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this
subsection of an application filed in the United States only if the international application designated the United
States and was published under Article 21(2) of such treaty in the English language.

7.   Claims 17-19, 21, 23-25 are rejected under 35 U.S.C. 102(e) as being anticipated by Lim

(U.S. Patent No. 6,526,521).

As in claim 17, Lim discloses a method for regrouping processor units in a fault-tolerant

system, comprising:

determining the ability of each processor unit to communicate with other processor units

in the system *(column 7 lines 19-27 and 35-36, column 8 lines 9-21, column 10 lines 52-57, and*

column 11 lines 57-61, which discloses a determination of the ability for processing units HOSTs

to communicate with the storage system processor unit 26 via pathway sets 24);

forming at least two candidate groups with the same number of processor units that are

able to communicate with each other *(Fig. 1; column 6 lines 57-64, where HOST A [first*

processing unit] and storage system 26 [second processing unit] is interpreted as one candidate

group with two processing units and HOST B and storage system 26 is interpreted as a second

candidate group also with two processing units, which communicate with one another via link

27); and.

evaluating connectivity condition scores (CCSs) for each candidate group of the

processor units, wherein each CCS indicates the connectivity condition of one communication

path associated with the corresponding processor unit *(column 7 lines 19-27 and 35-36, column 8 lines 9-21, column 10 lines 52-57, and column 11 lines 57-61, where the entirety of a group 24 (i.e. 24-A) is interpreted as a path, and the number of failed links on the path is interpreted as determining a connectivity condition)*.

As in claim 18, Lim discloses the CCS is based on the number of connectivity errors experienced by the corresponding communication path *(column 7 lines 19-27 and 35-36, column 8 lines 9-21, column 10 lines 52-57, and column 11 lines 57-61, where the number of failed links [connectivity errors] on a pathway set 24 [communication path] is interpreted as a CCS)*.

As in claim 19, Lim discloses at least one of the CCSs is based on [a] history of connectivity errors experienced by the corresponding communication path *(column 7 lines 19-27 and 35-36, column 8 lines 9-21, column 10 lines 52-57, column 11 lines 30-61, and column 13 lines 31-34, where the number of failed links in a pathway set is interpreted as a cumulative count of the number of errors in a communication path that can occur over a period of time [history])*.

As in claim 21, Aoki discloses forming a bi-directional CCS for each processor unit *(column 7 lines 19-27 and 35-36, column 8 lines 9-21, column 10 lines 52-57, and column 11 lines 57-61, where the number of failed links [CCS] per HOST [processor unit] are interpreted as bi-directional because communication between a HOST and storage system 26 occurs in two directions [read vs. write])*; and

selecting between the at least two candidate groups to include in the system based on the

sum of the bi-directional CCSs for the processor units in each group *(column 16 lines 4-25,*

where HOST X is selected over HOST A in response to the number of link failures [CCS] in a

pathway set 24-A).

As in claim 23, Lim discloses an apparatus for regrouping processor units in a fault-

tolerant system, comprising:

means for forming at least two candidate groups of processor units that are able to

communicate with each other *(Fig. 1; column 6 lines 57-64, where HOST A and storage system*

26 is interpreted as one candidate group and HOST B and storage system 26 is interpreted as a

second candidate group, which communicate with one another via link 27); and

means for evaluating connectivity condition scores (CCSs) for each candidate group of

the processor units, wherein each CCS indicates the severity of connectivity errors experienced

by one communication path associated with the corresponding processor unit *(column 7 lines 19-*

27 and 35-36, column 8 lines 9-21, column 10 lines 52-57, and column 11 lines 57-61, where the

entirety of a group 24 (i.e. 24-A) is interpreted as a path, and the number of failed links on the

path is interpreted as determining the severity of connectivity errors); and

means for selecting one of the at least two candidate groups based on the CCSs *(column*

16 lines 4-25).

As in claim 24, Lim discloses means for counting the number of connectivity errors

experienced by the corresponding communication path during an observation period *(column 7*

lines 19-27 and 35-36, column 8 lines 9-21, column 10 lines 52-57, column 11 lines 57-61, and

column 13 lines 31-34, where the number of failed links in a pathway set is interpreted as a

count of the number of errors in a communication path).

As in claim 25, Lim discloses means for factoring into the CCS connectivity errors

experienced by the corresponding communication path during at least one previous observation

period *(column 7 lines 19-27 and 35-36, column 8 lines 9-21, column 10 lines 52-57, column 11*

lines 30-61, and column 13 lines 31-34, where the number of failed links in a pathway set is

interpreted as a cumulative count of the number of errors in a communication path that can

occur over a period of time (multiple observation periods)).

Allowable Subject Matter

8.   Claims 12, 15, and 22 are objected to as being dependent upon a rejected base claim, but

would be allowable if rewritten in independent form including all of the limitations of the base

claim and any intervening claims.

The following is a statement of reasons for the indication of allowable subject matter:

As in claim 12, the inclusion of the limitation **normalizing each set of CCSs based on**

the single score, when read within the scope of the remainder of the limitations of the claim,

including base claim 11, makes claim 12 allowable over the prior art.

As in claim 15, the inclusion of the limitation **a single score representing the sum of the CCSs for the processor unit**, when read within the scope of the remainder of the limitations of the claim, including base claim 14, makes claim 15 allowable over the prior art.

As in claim 22, the inclusion of arbitrarily choosing between candidate groups based on a sum connectivity scores, when read within the scope of the remainder of the limitations of the claim, including base claim 21, makes claim 22 allowable over the prior art.

Conclusion

9.   The prior art made of record and not relied upon is considered pertinent to applicant's disclosure:

U.S. Patent No. 5,423,024 Cheung discloses fault-tolerant multiprocessors.

U.S. Patent No. 4,627,055 Mori et al. discloses multiprocessors with redundant connections.

U.S. PGPub 2002/0144175 Long et al. discloses multiprocessors in a switching fabric.

U.S. Patent No. 5,592,610 Chittor discloses a connectivity matrix.

10.   Any inquiry concerning this communication or earlier communications from the examiner should be directed to Paul Contino whose telephone number is (571) 272-3657. The examiner can normally be reached on Monday-Friday 9:00 am - 6:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Scott Baderman can be reached on (571) 272-3644. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

PFC
7/24/2006

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